

What is claimed is:

1.

A purified and isolated nucleotide sequence which encodes upon expression a regulatory protein characterized by the following:

- (a) is approximately 45 kD;
- (b) is expressed primarily under heat shock conditions;
- (c) is localized in chloroplasts;
- (d) has high homology to chloroplast elongation factor EF-Tu, from *E. coli* or tobacco;

said nucleotide sequence being capable of hybridizing under conditions of high stringency to SEQ ID NO:6 (putative coding sequence).

2.

The nucleotide sequence of claim 1 wherein said sequence is SEQ ID NO:5.

3.

An expression construct comprising:  
a nucleotide sequence according to claim 1, operatively linked to a regulatory region capable of directing expression of a protein in a plant cell.

4.

A vector capable of transforming or transfecting a host cell, said vector comprising an expression construct according to claim 3.

5.

The vector of claim 4 wherein said vector is a plasmid based vector.

6.

The vector of claim 4 wherein said vector is a viral based vector.

7.

A prokaryotic or eukaryotic host cell transformed or transfected with a vector according to claim 4.

8.

The host cell of claim 7 wherein said cell is a plant cell.

9.

A regulatory protein which exhibits the following characteristics:

- (a) is approximately 45 kD;
- (b) is expressed primarily under heat shock conditions;
- (c) is localized in plant chloroplasts;
- (d) has high homology (80% or greater) to chloroplast elongation factor EF-Tu, from *E. coli* or tobacco and comprises at least 80% amino acid sequence homology to SEQ ID NOS:1, 2, 3 or 4.

10.

The protein of claim 9 wherein said protein comprises SEQ ID NO:1.

11.

The protein of claim 9 wherein said protein comprises SEQ ID NO:2.

12.

The protein of claim 9 wherein said protein comprises SEQ ID NO:3.

13.

The protein of claim 9 wherein said protein comprises  
SEQ ID NO:4.

14.

A method for increasing plant tolerance to heat and  
drought comprising:

introducing to a plant cell a genetic construct  
comprising:  
a nucleotide sequence which encodes a regulatory protein  
characterized by the following:

- (a) is approximately 45 kD;
- (b) is expressed primarily under heat shock conditions;
- (c) is localized in chloroplasts;
- (d) has high homology to chloroplast elongation factor  
EF-Tu, from *E. coli* or tobacco;

said nucleotide sequence being operably linked to promoter  
and regulatory regions capable of inducing expression in a  
plant.

15.

The method of claim 14 wherein said expression construct  
elements cause expression during stress.

16.

The method of claim 14 wherein said promoter is selected  
from the group consisting of: a constitutive, an inducible,  
and an organ specific promoter.

17.

The method of claim 14 further comprising the step of:  
selecting plants which are transformed with said construct.

18.

The method of claim 14 wherein said expression construct further comprises a selectable marker gene.

19.

A method of identifying heat shock EF-Tu genes in plant species comprising:  
screening the genome of said plant species for a sequence that is homologous to SEQ ID NO:5 or a region of at least 100 bases thereof.

20.

A transformed plant, which plant is substantially tolerant or resistant to one or more environmental conditions selected from the group consisting of excess heat and drought, wherein the cells of the plant comprise a recombinant DNA segment encoding EF-Tu, and wherein the EF-Tu is expressed so as to confer tolerance to the transformed plant to one or more of the environmental conditions that adversely affect cell metabolism, plant growth, or development of the corresponding untransformed plant.

21.

A transgenic plant containing a DNA construct encoding EF-Tu wherein said DNA construct is expressed so that the plant exhibits tolerance to one or more conditions selected from the group consisting of excess heat and drought, wherein said resistance is not present in a corresponding plant not containing the DNA construct.

22.

A transgenic plant according to claim 21 wherein the DNA construct comprises a promoter.

23.

A seed produced by the transgenic plant of claim 21 which comprises the DNA construct.

24.

A progeny transgenic plant derived from the transgenic plant of claim 21 wherein said progeny plant expresses said DNA construct so that the progeny plant exhibits said tolerance.

25.

A transgenic plant according to claim 21 wherein the plant is a maize plant.

26.

A seed derived from the progeny plant of claim 24 wherein said seed comprises the DNA construct.

27.

A transgenic plant according to claim 21 wherein the plant is obtainable by a process comprising the steps of: bombarding intact regenerable plant cells with microprojectiles coated with the DNA construct; identifying or selecting a population of transformed cells; and regenerating a transgenic plant therefrom.

28.

A method of increasing the tolerance of a plant to heat or drought, comprising: introducing into cells of a plant an expression cassette comprising a preselected DNA segment encoding EF-Tu, to yield transformed plant cells; and regenerating a plant from said transformed cells, wherein the EF-Tu is expressed in the cells of the plant so as

to render the transformed plant substantially tolerant to drought or excess heat that inhibits the cell metabolism, growth, or development of an untransformed plant.

29.

A method according to claim 28 further including the step of:

obtaining progeny from the transformed plant which comprise the DNA construct.

30.

A method according to claim 29 wherein the progeny are obtained by crossing the transformed plant with an inbred line.

31.

A method according to claim 29 further including the step of:

obtaining seed from the progeny and obtaining further progeny plants comprising the DNA construct from the seed.